Muddy Waters: Reducing post-fire erosion in an intensifying fire environment

Wildfire size is increasing and so is the erosion potential, especially within intensified fire environments. Fires such as the record-breaking Colorado Cameron Peak Fire in 2020 are so large, and burn so hot, there is very little, if any vegetation left behind. The soil is left vulnerable and exposed to weather events. Extreme flooding events followed Cameron with a vengeance, causing destruction to natural and manmade features in the Poudre River Corridor, just west of Fort Collins, CO. Erosion increases sediment and wildfire ash in waterways and can cause hazards to people, property, and water supplies.

Given these changing conditions, how might land managers from all agencies work together to adapt erosion mitigation practices following these severe fire events?

Pete Robichaud, a Research Engineer with the Rocky Mountain Research Station (RMRS), and his team are seeking to answer this question by studying what happened on existing large fires and using that knowledge to build predictive

Straw bale check dam filled to maximum sediment holding capacity after four rain events. Pete has been studying the effectiveness of straw bale check dams at reducing post-fire sediment yields from steep ephemeral channels. USDA Forest Service photo by Pete Robichaud.

models. They're using the recovery curves from old fires, such as the Hayman Fire in 2002, to predict the recovery of new fires. The Hayman Fire devastated large areas in Colorado and was a preview of high severity fires and the associated erosion to come. The Hayman Fire burned area is still recovering today. Predictive models are helping postfire recovery teams make informed decisions and recommendations given these intensified conditions. This is accomplished using sophisticated but easy-to-use erosion risk management tools and recent research about the role of mulch in short and long-term erosion reduction and straw bale check dam effectiveness.

These erosion risk management tools with advanced erosion predictive capabilities are readily available to managers. A portal known as FS-WEPP,

or Forest Service Interfaces for the Water Erosion Prediction Project Computer Model, is a launchpad to a set of interfaces. It is designed to allow users to quickly evaluate erosion and sediment delivery potential from forests, rangeland and chaparral burned areas, and for forest roads and timber harvest areas. The erosion rates and sediment delivery are predicted by the Water Erosion Prediction Project (WEPP) model, using input values for forest conditions. Water Erosion Prediction Project cloud (WEPPcloud) allows users to upload a burn severity map and predict erosion based on burn severity. Erosion Risk Management Tool (ERMiT) allows users to predict the probability of a given amount of sediment delivery from the base of a hillslope following variable burns on forest, rangeland, and chaparral conditions in each of five years following wildfire and compare various treatments to reduce erosion.

Land managers now have access to tools that quantify post-fire treatment outcomes and help managers choose 'the biggest bang for their buck.' Robichaud says, "We now have really robust, data-backed models that managers can use to make informed postfire erosion control decisions." Pete knows the tools are being used because he spends every day during fire season answering questions from people who are using the models in real time.

Collecting sediment-laden runoff from a hillslope plot with wood shreds after the 2002 Hayman Fire. USDA Forest Service photo by Pete Robichaud.

PROJECT LEAD

Pete Robichaud is a Research Engineer with the USDA Forest Service, Rocky Mountain Research Station in Moscow, Idaho. Pete studies and models soil erosion as affected by wildfires. He oversees the FS-WEPP suite of tools.

KEY MANAGEMENT CONSIDERATIONS

- The suite of FSWEPP tools developed by RMRS scientists and partners from the University of Idaho and Washington State University allows managers to predict hillslope erosion, watershed peak flows, and sediment yields from wildfires, prescribed fires, and forest management activities.
- ERMiT results show a higher probability of more erosion and sediment being transported in high severity fires, especially on steep terrain.
- The Hayman fire study revealed that wood mulch was the most stable post fire treatment, and it persisted longer than other treatments.
- Increasing the number of straw bale check dams to increase trapping capacity in future installations could achieve greater sediment yield reduction.

FURTHER READING

Robichaud, Peter R.; Storrar, Keenan A.; Wagenbrenner, Joseph W. 2019. Effectiveness of straw bale check dams at reducing post-fire sediment yields from steep ephemeral channels. Science of the Total Environment. 676: 721-731.

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